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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/922,980	08/06/2001	Diana Xiaobing Ma	005825 USA/ETCH/DRIE	1441

32588 7590 07/30/2003

APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

EXAMINER

ROCCHEGIANI, RENZO

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/922,980

Applicant(s)

MA ET AL.

Examiner

Renzo N. Rocchegiani

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11, 14-17, 19, 20 and 22-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11, 14-17, 19, 20 and 22-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-11, 14-17, 19-20 and 22-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admitted prior art (See figures and specification of pending application) in view of U.S. Patent No. 5,186,718 (Tepman et al.).

Applicant admits that it is well known in the art to perform a process that comprises the steps of patterning a photoresist mask material over a dielectric layer, such as an oxide layer, etching the dielectric layer using fluorocarbons and a the patterned mask down to an etch stop layer, ashing the mask layer, removing the exposed etch stop layer, depositing a barrier layer comprising tantalum in the trench, depositing a copper seed layer wherein either one of the deposition steps are performed via sputtering. (See Fig. 1-5 in application and Background section of Specification).

Applicant points out that the prior art does not teach performing these steps using an apparatus that allows for sub-atmospheric conditions, i.e. vacuum, and wherein the wafer is transferred from one process chamber to the next without breaking the vacuum condition and without exposing the wafer to the atmosphere.

Tepman et al. teach the use of an apparatus that would allow the transfer of a wafer from one chamber to another while maintaining vacuum conditions and thus

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without exposing the wafer to the atmosphere, such apparatus being adaptable to any process including but not limited to: chemical etching, deposition, and heat treatment steps. (col. 4, lines 10-30 and col. 5, lines 15-42). Tepman et al. teach that the transfer chambers are equipped with wafer handling robots. (items 40 and 42, and col. 5, lines 42-65). Tepman et al. also teach connecting transfer chambers through load lock chambers that are doubly gated so as to maintain vacuum conditions in the separate transfer chambers during the transfer of the wafer from one transfer chamber to the other. (items 26 and 27, col. 4, lines 55-67). Furthermore, Tepman et al. teach that the first and second transfer chambers may be operated at different vacuum levels, thus one chamber will be maintained at a pressure that is higher or lower than the other chamber. (col. 2, lines 30-35). Because Tepman et al. expressly teaches that the wafer are transferred through the load lock chambers, it inherently implies that these load lock chambers are equipped with a wafer holder that is accessible to the wafer handling robots located in the two transfer chambers, for otherwise the apparatus would not be able to function.

It would have been obvious to one having ordinary skill in the specific art to combine the teachings of Tepman et al. to the prior art teachings admitted by the applicant to arrive at the claimed invention, since as taught by Tepman et al. using such an apparatus would result in a process with less contamination, increase throughput, with minimal pump down time, and a vacuum system with enhanced capability. (See Tepman et al., col. 1, lines 48-67). Furthermore, because the prior art, Tepman et al., teaches that the apparatus is maintained at vacuum conditions (i.e. less than 1

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atmosphere), it would have been obvious to one of ordinary skill in the art to use the claimed pressure ranges since it has been held that when there is an overlap in ranges and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

### ***Claim Objections***

3. Claims 1 and 8 are objected to because of the following informalities: claim 1, line 7, recites "said oxide layer" this appears to refer to the dielectric layer, but as phrased the claim suffers of a lack of antecedent basis. Claim 8, recites "said transfer chamber", because there are two transfer chambers being claimed, it is not clear to which transfer chamber this limitation applies. Appropriate correction is required.

### ***Response to Arguments***

4. Applicant's arguments with respect to claims 1-11, 14-17, 19-20 and 22-31 have been considered but are moot in view of the new ground(s) of rejection. Applicant makes three main arguments: 1) that the examiner has no authority in finding that apparatus specifications are not limiting to a method claim, 2) that a load lock is different from the transfer valves in Maydan et al. and 3) that the examiner has not address the specific pressure of the transfer chambers. The examiner will address these three main point in order. First, even though it is now a moot point since the applicant has amended the claims to recite method steps and thus the objections have been withdrawn, the examiner directs applicant attention to *In re Tarczy-Hornoch* 158

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USPQ 141, 150 (CCPA 1968) and to Ex Parte Pfeiffer 135 U.S.P.Q. 31 (1961).

Nonetheless, the examiner restates that this point is now moot because of the amendment filed. Second, the examiner has formulated a new set of rejections with one of the references applicant submitted in the IDS. After a closer reading, the examiner found that Maydan et al. did not render the claims obvious as amended, but that Tepman et al. does. Third, and finally, the applicant argues that the prior art does not render obvious the pressure in the different chambers. The examiner does not agree. Tepman et al., as did Maydan et al., discloses that the different chambers are maintained at vacuum conditions. Vacuum conditions is understood to mean a pressure of less than 1 atmosphere. This means that there is an overlap in the range disclosed in the prior art and of that claimed. Thus, the pressure ranges claimed, even though not specifically taught, are rendered obvious as optimization parameters. For the foregoing reasons, the examiner has deemed the pending claims to be not patentable.

### ***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renzo Rocchegiani whose telephone number is (703) 308-5839. The examiner can normally be reached on Monday through Friday from 8:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the

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examiner's supervisor, Matthew Smith, can be reached at (703) 308-1323. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

RNR

July 24, 2003

A handwritten signature in black ink, appearing to read 'M. Smith', is positioned above the printed name and title.

MATTHEW SMITH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800